LORING AIR FORCE BASE, AIRFIELD
Central portion of base
Limestone Vicinity
Aroostook County
Maine

HAER No. ME-64-A

HAER
ME
2-LIME.V,
1A-

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

PHOTOGRAPHS

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
Northeast Region
Philadelphia Support Office
U.S. Custom House
200 Chestnut Street
Philadelphia, Pennsylvania 19106

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HISTORIC AMERICAN ENGINEERING RECORD

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Location:
Central portion of base
Limestone Vicinity
Aroostook County, Maine

USGS 7.5-minute Fort Fairfield NW Quadrangle
Universal Transverse Mercator Coordinates
1) 19:584285.5197975; 2) 19:585350.5197975;
3) 19:584646.5198050; 4) 19:583919.5201610

Date(s) of Construction:
1947-1987

Designer:
USACE

Contractors:
Lane Construction Corporation
T.W. Cunningham, Inc.

Present Owner(s):
United States Air Force
Air Force Base Conversion Agency (AFBCA) - Loring
RR 1, Box 1719
Limestone, Maine 04750-7943

Present Occupants:
Vacant

Present Use:
Vacant

Significance:
The airfield was the center of the strategic mission of Loring Air Force Base. It was one of the earliest airfields designed specifically for the B-36, which was the newest aircraft in the Strategic Air Command (SAC) inventory at that time. The airfield was designed and built using specialized construction techniques in response to difficult and unusual site condition, and the enormous weight and size of the B-36 bomber. Important construction features included the extent of the heavy earthwork, the establishment of on-site quarries, the unusual 70-inch foundation thickness, the bituminous concrete pavement that provided a flexible base for aircraft landings and take-offs, and the dimensions of the runway. At 12,000 feet, the runway was one of the world's longest at that time.

Project Information:

Pursuant to the recommendations of the 1990 Defense Base Closure and Realignment Commission, Loring AFB was closed in September 1994. In order to mitigate adverse effects to historic properties that may occur with conveyance of property to a non-federal agency, mitigation measures were recommended in the Loring AFB Historic Building Inventory and Evaluation. The Maine State Historic Preservation Officer (SHPO) has concurred with the Air Force's recommendation of Historic American Building Survey (HABS)/Historic American Engineering Record (HAER) recordation of National Register-eligible properties in lieu of nomination to the National Register.

Earth Tech, Inc.
1461 East Cooley Drive, Suite 100
Colton, California 92324

SUMMARY DESCRIPTION OF LORING AIR FORCE BASE, AIRFIELD

Historical Background. Construction of the airfield at Loring Air Force Base (AFB) was begun in 1947. The airfield was designed by the U.S. Army Corps of Engineers (USACE). The flexible pavement design and corresponding specifications were an adaptation of the California Bearing Ratio (CBR) developed by the California State Highway Department. The CBR is based upon material compaction in relation to repetitive wheels loads and weight distribution (Allen 1949:458-459). The contractors utilizing this revolutionary design included Lane Construction Corporation of Meriden, Connecticut, and T.W. Cunninghan, Inc., of Bangor, Maine. The project fell under the jurisdiction of the New England Division of the USACE. Army Resident Engineer Robert E. Lee supervised the construction.

Completion of the airfield in November 1948 marked the official opening of Limestone Army Air Field (AAF) as a functional and accessible Strategic Air Command (SAC) base. Construction of an operations building with control tower, a 250-person barracks, a power plant, a monolithic Arch Hangar, and a Parking Apron extension, also during Phase I, allowed the growing base to be at least minimally operational at the earliest date.

The first B-36 to use Loring AFB landed, refueled, and departed on 16 June 1950. Loring AFB's first permanently assigned aircraft was a C-47 that arrived on 13 August 1950 for the 4215th Base Service Squadron (later merged with the 42nd Bombardment Wing [BW]). Construction schedules at Loring AFB were accelerated in 1951 as the conflict in Korea progressed. A 300-foot runway extension and the Southern Warmup Pad were added to the airfield. Eight Luria hangars were constructed at the southern end of the runway to provide maintenance services for the aircraft. None of these hangars remain today. The main runway was resurfaced and a 3,000-foot runway extension was constructed on its north end in 1955 at a cost of $24.517 million, increasing the runway length to 12,100 feet. A number of additional aircraft hangars were constructed during this time as well. In 1956, the Alpha Taxiway was extended, and a Northern Warmup Pad and a Calibration Pad were constructed.

In 1959, the runway was repaired due to damage caused by chemical deicing fluid that destroyed the upper pavement section. Damage was so extensive that the entire central section needed to be replaced down to sub-grade level. From 1 July to late September, all base aircraft departed and all flying operations ceased for the $500,000 renovation.

The 1960s saw the continuation of base alert status with practical exercises and flying sorties. The airfield maintained its position as the central structure necessary to sustain the base's deterrent mission. In 1975, in response to the need for space, the Tanker Apron was constructed to provide an area for parking and refueling. A $3-million runway and taxiway repair project took place in 1981. In 1985, as part of a base improvement project, Loring AFB finally constructed the parallel runway that had been a part of its original airfield design at a cost of $405,715. The Alternate Runway became the main thoroughfare for tanker aircraft. This allowed simultaneous take-off of bombers on the North-South Runway and tankers on the Alternate Runway, a significant time-saving measure.

Description. The airfield at Loring AFB is a large complex of runways, taxiways, aprons, and associated structures and equipment necessary to maintain basewide aircraft operations. The 930-acre complex has a north-south orientation, and forms the operational nucleus of the base. West of the airfield are the aircraft hangars, base housing, and administrative offices. East of the airfield are the Weapons Storage Area and the SAC Alert Area. The airfield is composed of a North-South Runway, an Alpha Taxiway with its associated Calibration Pad and Warm-up Pads, an Alternate Runway (Taxiway J) with its associated turnaround, a Parking Apron, and a Tanker Apron. Associated buildings and equipment include a Surface Weather Facility, an Electric Power Station Building, a Precision Approach Radar, a Sewage Septic Tank, a Temperature/Humidity Measuring Set, a Wind Measuring Set, and Runway Obstruction Lights.

North-South Runway. The North-South Runway (No. 500) was a part of the original Phase I construction at the base and was completed in November 1948. At 12,100 feet long and 300 feet wide, it was considered one of the longest runways in the world at the completion of construction. Comparable runways at Fairfield AFB, Ohio, and Portsmouth AFB, New Hampshire, are 12,000 feet long and 300 feet wide. However, neither of these were constructed under the environmental hardships of Loring AFB or required the construction depth of Loring AFB. The main runway is constructed of bituminous concrete. The 1,000-foot overruns at both ends of the runway are constructed of rigid Portland cement concrete. The pavement slopes 1.5 percent from the centerline. Five lateral taxiways extend westward from the main runway and connect it to the parallel Alternate Runway, the Alpha Taxiway, and the Warmup Pads.

Alternate Runway (Taxiway J). The Alternate Runway, or Taxiway J, is constructed of bituminous concrete. It is situated west of the main runway and runs parallel to it. Extending north from the Southern Warmup Pad, the Alternate Runway intersects the airfield's lateral taxiways. Above Taxiway D, the Alternate Runway coincides with the original Alpha Taxiway. The northern end has a 1,000-foot paved overrun. Extending westward from the northern end of the Alternate Runway are a Calibration Pad and an aircraft Turn Around. Extending to the east is the north Warmup Pad.

Alpha Taxiway. The Alpha Taxiway (No. 501) is an approximately 1.8-mile-long, bituminous concrete airstrip that parallels both the North-South and Alternate (Taxiway J) runways; it is west of the Alternate Runway. Lateral taxiways connect the Alpha Taxiway to the parallel runways. The Alpha Taxiway is just east of the main hangar maintenance and parking area. The Alpha Taxiway was part of Loring AFB's original Phase I construction and was completed in December 1948 at a cost of $1.933 million. The Alpha Taxiway was extended to the north in 1956. A Calibration Pad and Northern Warmup Pad were constructed in conjunction with the extension.

Calibration Pad. The Calibration Pad (No. 566) is a circular concrete structure that extends westward from the northern end of the Alternate Runway. The pad is a paved area where aircraft are positioned for the calibration of the magnetic standby compass and the magnetic azimuth detector prior to take-off. It was completed in 1956 at a cost of $171,000.

Warmup Pads. Warmup Pads are concrete structures located at both ends of the runway system. They provide a holding area for aircraft preparing for take-off. These pads are at the north and south ends of the airstrip. The Southern Warmup Pad (No. 551) lies on the north side of the southernmost lateral taxiway and is situated in the area between the North-South Runway and the Alpha Taxiway. This pad was constructed in 1952 at a cost of $252,000 and incorporates the southern end of the Alternate Runway. The Northern Warmup Pad (No. 550) lies on the north side of the northernmost lateral taxiway and is situated in the area between the North-South Runway and the Alternate Runway. This pad was constructed in 1956 at a cost of $290,000.

Parking Apron. The Parking Apron (No. 520) is a large, bituminous concrete structure that provides parking, servicing, and a loading area for base aircraft. The apron is situated adjacent to and west of the southern end of the Alpha Taxiway, and gives access to the Arch Hangar and the Double Cantilever (DC) Hangar to the west. The Parking Apron was part of Loring AFB's Phase I construction and was finished in October 1948 at a cost of $1.120 million. The southern extension of this apron was added in 1949.

Tanker Apron. The Tanker Apron (No. 523) is a large, concrete structure that functions as a parking and refueling area for tanker-type aircraft. This apron is situated at the southern end of the Parking Apron and the southernmost lateral taxiway. Jet Blast Deflectors (No. 8402) are positioned around the perimeter of the Apron. The deflectors are concave, braced, corrugated metal barriers that withstand the force of jet blasts and deflect the blasts upward. The Apron was constructed in 1975 at a cost of $644,000.

Associated Buildings and Equipment. The airfield contains two associated buildings: a Surface Weather Facility (8000) and an Electric Power Station Building (8002). The Surface Weather Facility is a two-story, concrete-block structure used for weather observation at the airfield. The facility is situated between lateral Taxiways B and C, and between the Alternate and North-South runways. It was constructed in 1987 during the same period of base improvement in which the Alternate Runway was constructed. Located in the same area is an Electric Power Station Building constructed in 1976 as the power source for the airfield. These two buildings are not eligible for the National Register, either individually or as contributors to the historic district. They are fairly recent additions to the airfield and did not contribute significantly to the historic mission of Loring AFB, especially the earliest, most important period from 1948 to 1964.

Situated between the various runways and taxiways is a variety of airfield equipment including a Precision Approach Radar (8006), a Temperature/ Humidity Measuring Set (8008), a Wind Measuring Set (8369), and Obstruction Lights (16311). The Precision Approach Radar is adjacent to the airfield's Surface Weathering Facility and Power Station. It transfers information from the runway location to the control facility and was established in 1955. The Temperature/Humidity Measuring Set is just south of the Surface Weathering Facility and was constructed in 1990. It consists of an indicator and a transmitter composed of sensing elements, all of which are mounted on 6-foot masts above the ground. The Wind Measuring Set is just

north of the Southern Warmup Pad and between the Alternate and North-South Runways. It was constructed in 1978 and consists of a transmitter, indicator, and recorder that are mounted 13 feet above ground to measure representative wind velocity. The Obstruction Lights are situated in pairs along the North-South Runway, with two pairs at the southern end and two pairs at the northern end. These lights were installed in 1967 to identify objects that penetrate clearance plans. This equipment is not eligible for the National Register, either individually or as contributors to the historic district. This equipment is normally found at military airports and did not contribute significantly to the historic mission of Loring AFB in the same manner as the major airfield features.

Construction Details. As a consequence of northern Maine's adverse weather conditions, an intricate building method was used to construct Loring AFB's initial 930-acre airfield. The initial airfield, part of Loring AFB's Phase I construction, consisted of the North-South Runway, the Alpha Taxiway, and the Parking Apron. To avoid the area's frostline that penetrated the ground as deeply as 70 inches, engineers designed a runway base that would extend to a 6-foot depth. Under ordinary continental United States (CONUS) conditions, construction would extend to approximately 21 inches below ground level to avoid the frostline.

One of the most outstanding features of the construction process was the amount of heavy earthwork that needed to be performed. Using more than $5 million worth of heavy, earth-moving equipment, the airfield area was cleared during fall and winter 1947, exposing glacial till, clay, and rock. In January 1948, bulldozers were wrapped in tarpaulins to protect them from the 15-degree-below-zero temperatures. Excavation work began in May 1947. Approximately 1.5 million cubic yards of material were removed for the main runway alone; an additional 0.6 million cubic yards of material were moved for construction of the taxiway and parking apron. At the peak of work, more than 30,000 cubic yards of material was moved in one day (Allen 1949:465).

The construction design consisted of a layer of compacted earth fill, a 55-inch course of processed gravel placed in 12-inch layers, a 9-inch course of crushed stone in two separate layers, and a 3-inch course of hot asphalt pavement placed in two separate layers.

A first course of earth fill was laid by 15 bulldozers and 6 graders, and was compacted to 6-inch layers by 600 pounds per square inch (psi) tamping rollers. Pervious material, consisting of fine gravel, comprised the next 55-inch course. Commercial gravel treatment plants could not handle the amount of gravel needed at Loring AFB in one building season. The gravel was therefore obtained from the Chapman Pit borrow and stockpile area that was established by the contractors 3 miles west of the airfield construction site. To obtain gravel of a size that would not be weakened by heavy frost action, fine particles had to be removed.

Once the gravel was placed in 12-inch layers, metal drains were installed along the edges of the pavement, forming a drainage system that could carry approximately 80 percent of storm waters away from the runway. The gravel level was compacted to 100 percent maximum density by

two pneumatic-tired, sheepsfoot compactors. The heavier compactor weighed 200 tons and was hauled to the site by two large tractors in tandem.

After the gravel subgrade was laid, a 9-inch layer of crushed stone was installed in two separate layers. The layers were compacted by smooth-wheeled rollers. The crushed stone was obtained on site from a quarry and crushing plant approximately 1 mile west of the north end of the runway. The final layer of the airfield was a 3-inch coating of hot bituminous asphaltic concrete. Two asphalt plants produced the pavement mixture that provided the runway with a flexible surface that could withstand the intense weight of heavy B-36 bombers. The first phase of airfield construction was completed in November 1948. At an initial cost of $18 million (including excavation and processing costs), the airfield was the most expensive undertaking at Loring AFB (*Engineering News Record* 1949:56).

SOURCES OF INFORMATION

A. Engineering Drawings

Engineering drawings are kept on file at the Air Force Base Conversion Agency at Loring Air Force Base. Upon conveyance of the base property, the drawings will be kept on file at the Loring Development Authority at 5100 Texas Road, Limestone, Maine.

B. Historic Views

Historic photographs are kept on file at the Air Force Base Conversion Agency at Loring Air Force Base. Upon conveyance of the base property, the photographs will be kept on file at the Loring Development Authority at 5100 Texas Road, Limestone, Maine.

C. Bibliography

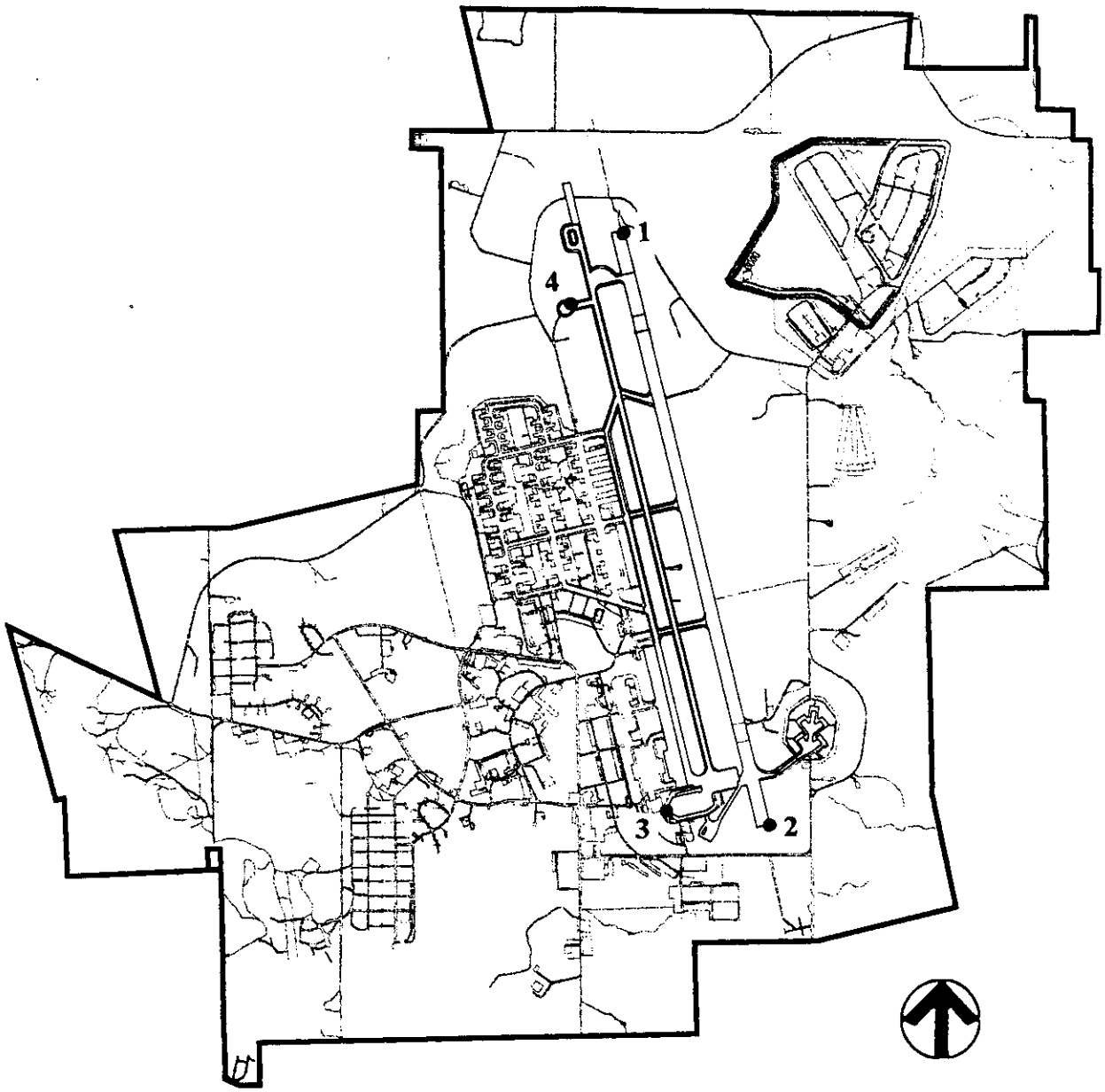
Allen, J.E., et al.
1949 "The Limestone AFB." *Boston Society of Civil Engineers Journal.* Vol. 36, October.

Engineering News Record
1949 "A Postwar Bomber Base Emerges," 3 February.

U.S. Air Force
1998 *Historic Building Inventory and Evaluation, Loring Air Force Base, Maine.*

D. Likely Sources Not Yet Investigated

All likely national and local archival sources have been investigated.

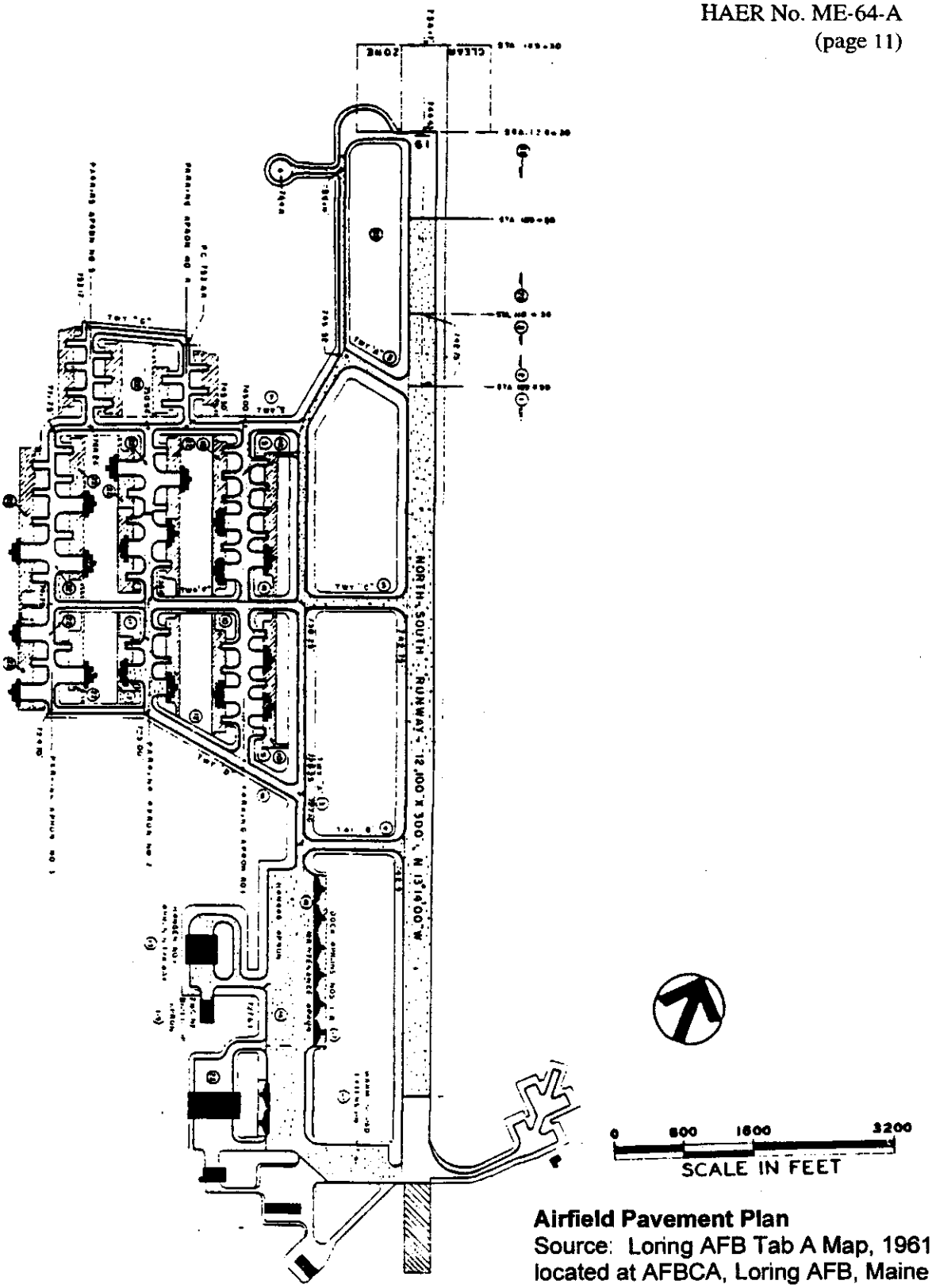


ROADS
BASE BOUNDARY
AIRFIELD

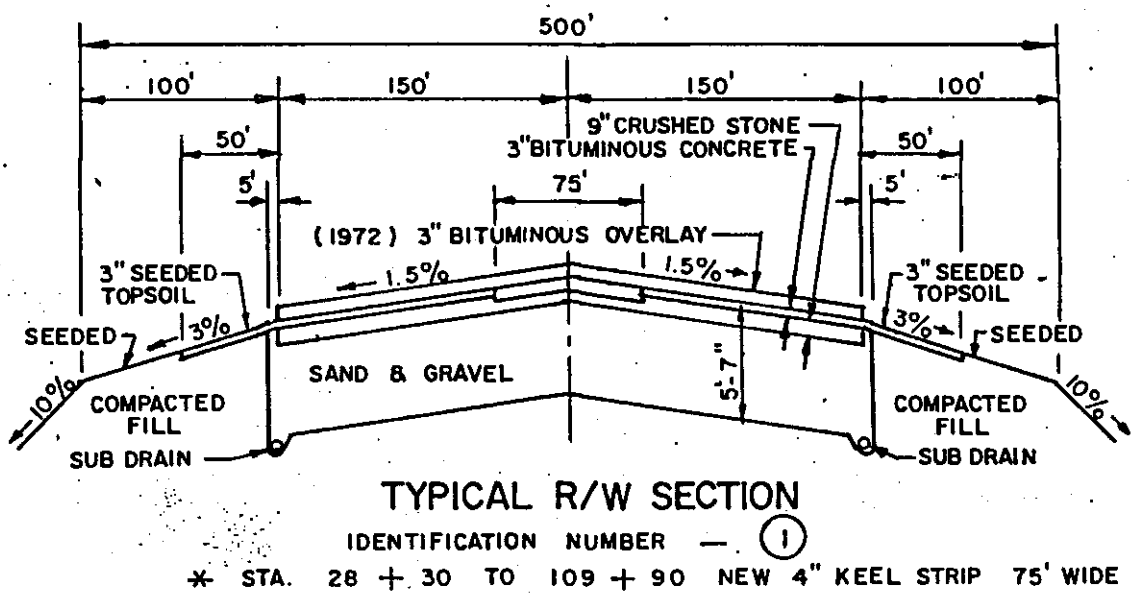
500 0 500 Meters

Loring Air Force Base
Airfield
UTM Coordinate Points
1) 19:584285.5197975
2) 19:585350.5197975
3) 19:584646.5198050
4) 19:583919.5201610

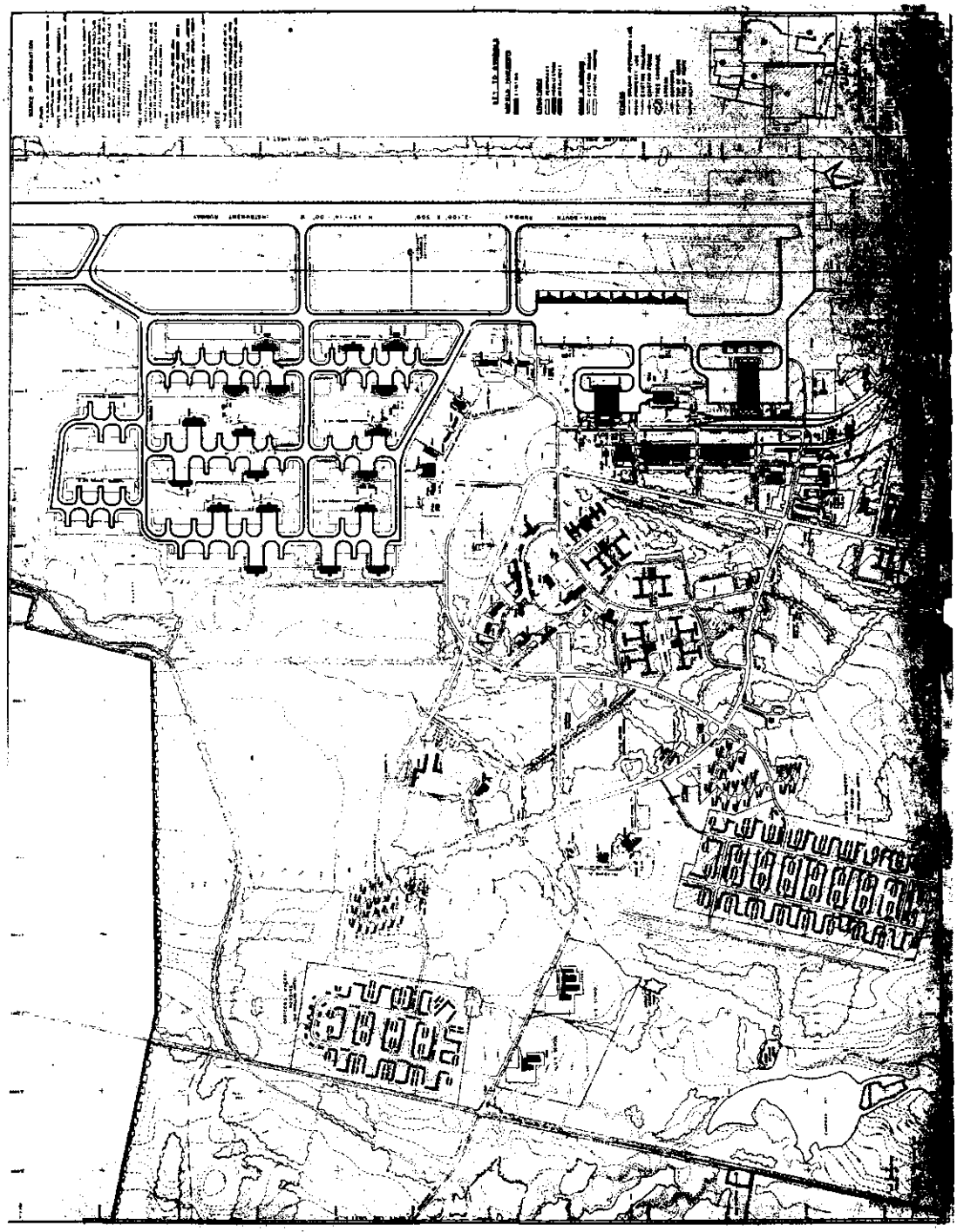
Location of Airfield
Source: Loring AFB Tab Map, 1993,
located at AFBCA, Loring AFB, Maine



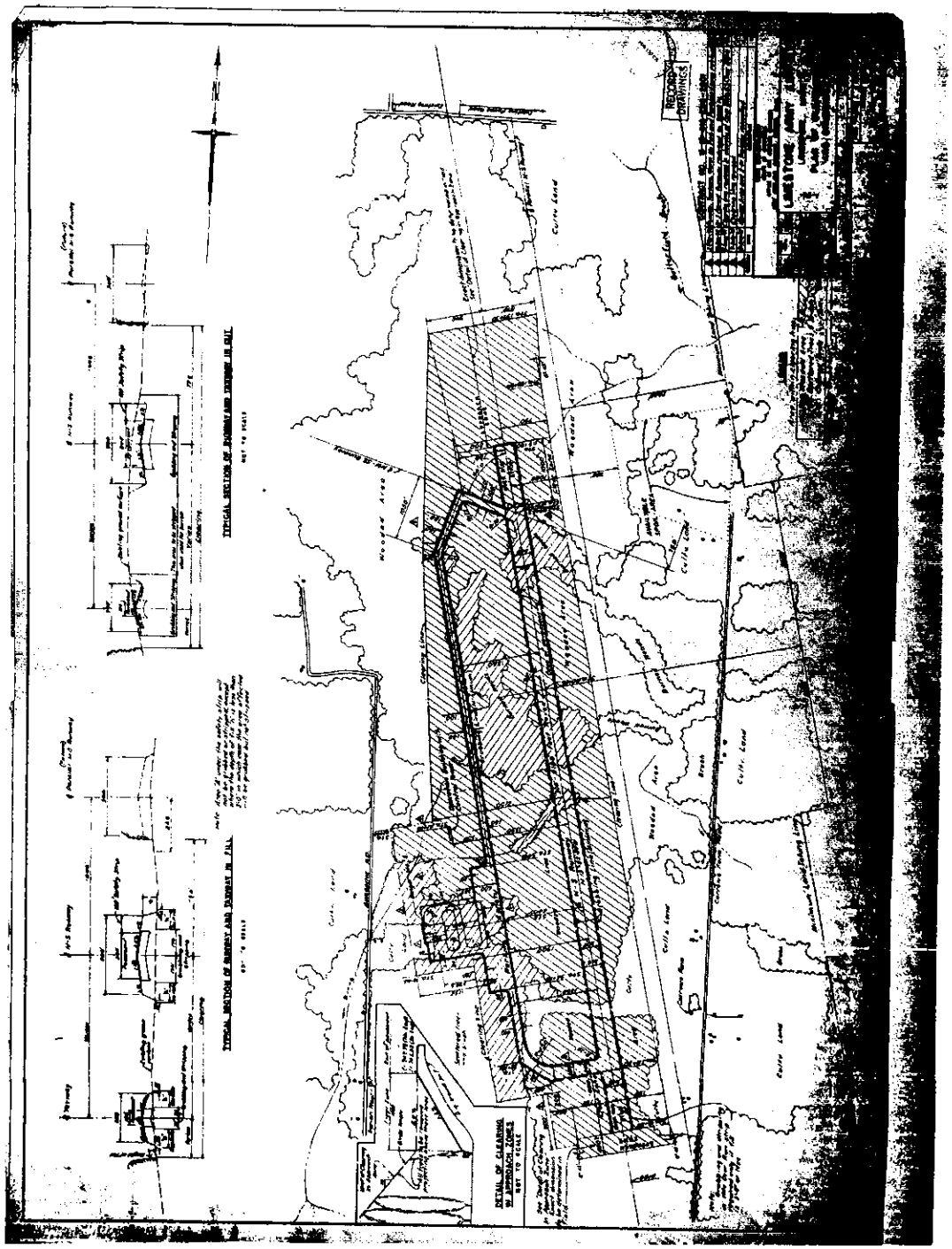
Airfield Pavement Plan
Source: Loring AFB Tab A Map, 1961, located at AFBCA, Loring AFB, Maine



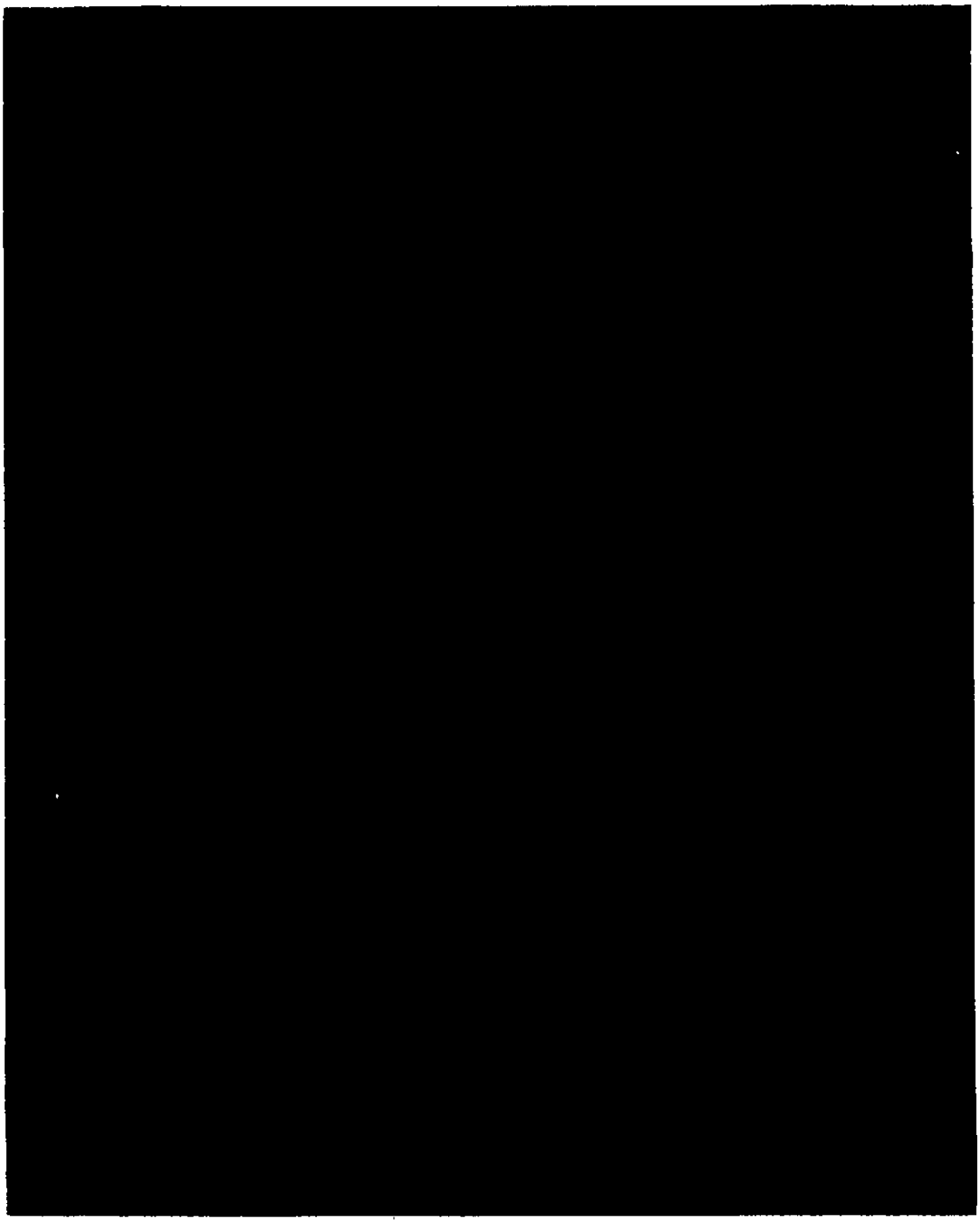
Typical Runway Section
Source: Loring AFB Tab E Map, 1990,
located at AFBCA, Loring AFB, Maine



Construction drawing of clearing the grubbing plan for Limestone Army Airfield, dated June 27, 1947, with revisions through April 23, 1948. Drawing located at AFBCA, Loring AFB, Maine.

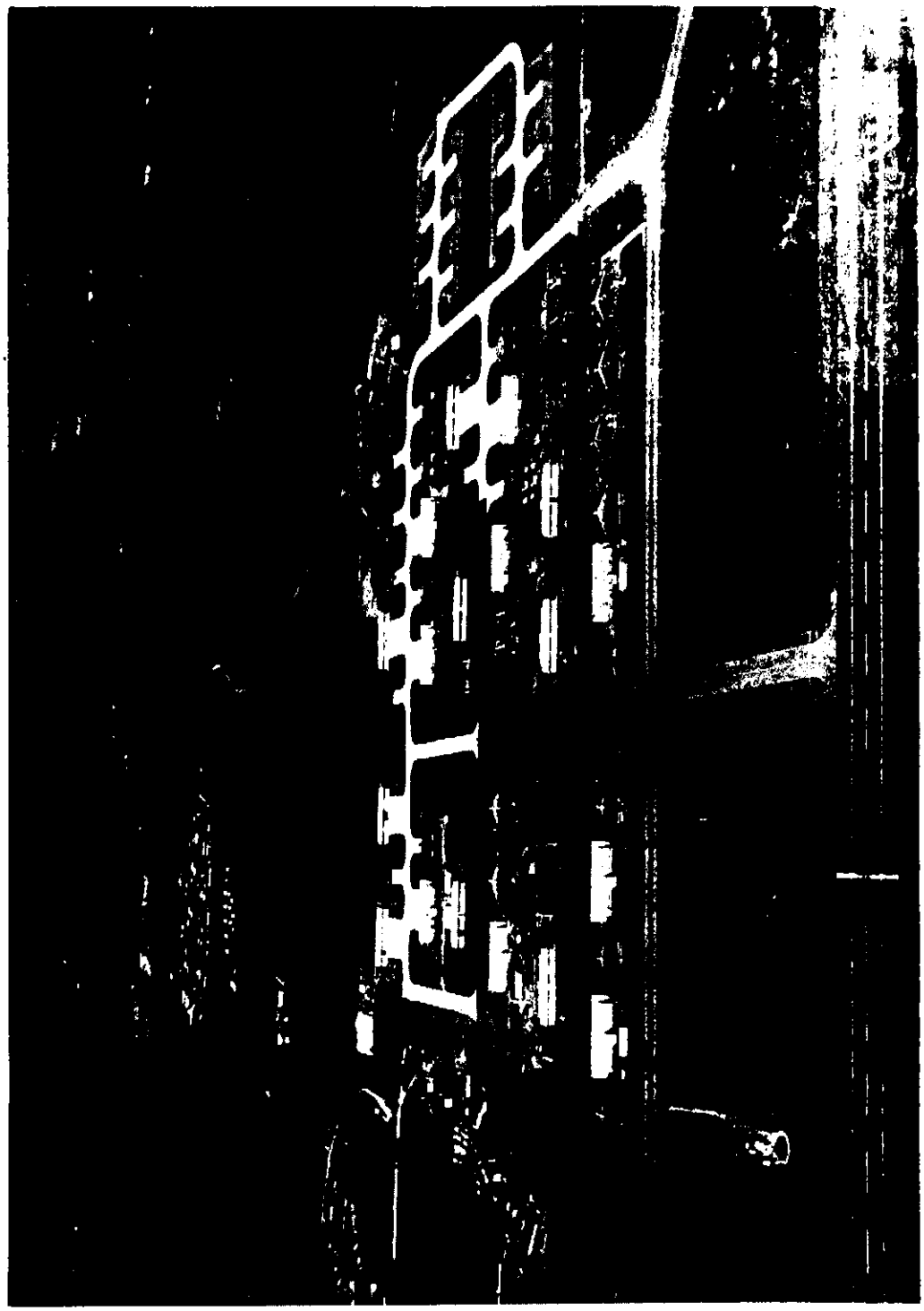


Construction drawing of basic layout plan for Loring Air Force Base Complex Master Plan, dated April 20, 1957. Drawing located at AFBCA, Loring AFB, Maine.



Limestone area prior to construction of Loring AFB, view facing south along approximate centerline of north-south runway, dated August 14, 1947. Photograph located at AFBCA, Loring AFB, Maine.

View of airfield with north-south runwey, Alphe Taxiway, Southern Werm-Up Pad, Parking Apron, end Arch Hengar, facing north, dated 1949. Photograph located at Air Force Bese Conversion Agency, Loring AFB, Maine.



Aerial view of Hangar and Maintenance Area, Alpha Taxiway, Alternate Runway (foreground), and associated lateral taxiways, view to the west, circa 1980. Photograph located at AFBCA, Loring AFB, Maine.